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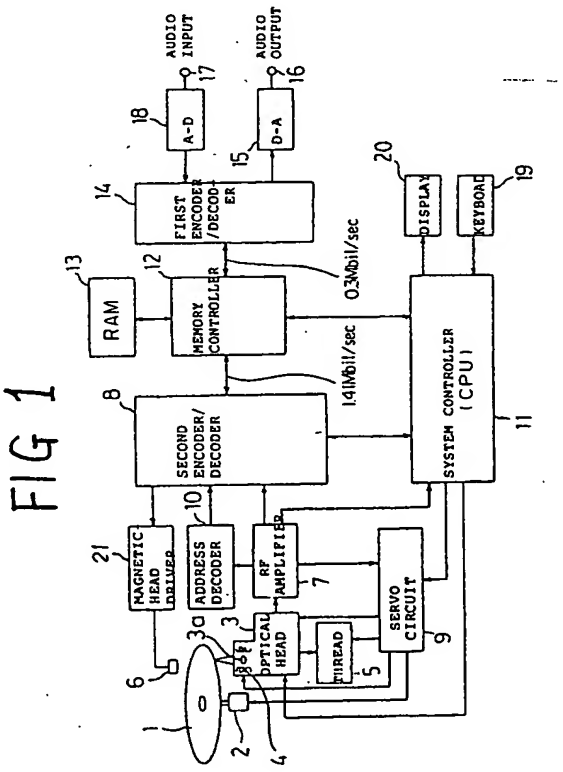
(54) Audio reproducing apparatus.

(57) An audio reproducing apparatus for used a disc-shaped recording medium. The reproducing apparatus includes a head, a memory, a signal processor, an input device and a controller. The head reads out data from the disc-shaped recording medium. The memory is stored the readout data outputted from the head. The signal processor processes the data from the memory and outputs the processed data as a reproducing audio signal. The input device inputs an operation information by the user. The controller controls the head and the memory and is inputted the operation information from the input device. The controller controls the memory to retain the data thereafter when data reproducing os stopped by a halt request made via the input device in the course of the data reproducing, and if the controller is received a request for resumption of the data reproducing from the input device, the controller controls the memory to start reading out the retained data in the memory.

FIG 1



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The present invention relates generally to an audio reproducing apparatus. More particularly, the present invention relates to an audio reproducing apparatus for used a disc-shaped recording medium.

In general, it is known an audio reproducing apparatus for used an optical disc such as a read-only optical disc, a magneto-optical disc. The optical disc is recorded digital audio data. An audio reproducing apparatus includes an optical head, a spindle motor, a servo circuit and a signal processing circuit. The optical disc is read out the digital audio data by the optical head. The optical disc is rotated by the spindle motor at a constant linear velocity. The output signal of the optical head is supplied to the servo control circuit. The servo control circuit generates a focusing servo signal, a tracking servo signal and a spindle servo signal according to the output signal of the optical head. The focusing servo signal and the tracking servo signal is supplied to an actuator of the optical head. As a result, a focusing servo and a tracking servo is executed. The spindle servo signal is supplied to the spindle motor. The spindle motor is driven to rotate the disc at the constant linear velocity. The signal processing circuit is carried out processing on the output signal from the optical head such as a decoding processing, a demodulating processing.

In order to execute reproducing of the data read out from the optical disc, a build-up process, an energizing process is required. The energizing process includes operations such as spindle rotation, focus search, the turning-on of the focus servo and the turning on of the tracking servo. It is not until the completion of the energizing process that an operation to read data can be started. For example, the energizing process is described in US-A-4,656,617.

Due to the build-up process, the energizing process, it takes at least two seconds for the user to be able to actually listen to reproduced sound after the user operates a play button.

Assume that music reproducing is stopped and it is desired to resume immediately the music reproducing from the stopped position. In this particular case, the resumption of the music reproducing gives rise to a problem that the user feels too long in waiting for the stopped music to be resumed. As a result, recognizing a poor operational response. The poor response is caused by the time required for the build-up process, the energizing process and an operation to access the stopped position.

According to a first aspect of the present invention, there is provided a disc reproducing apparatus comprising a head, a memory, a signal processor, an input device and a controller. The head reads out data from a disc-shaped recording medium. The memory is stored the readout data outputted from the head. The signal processor processes the data from the memory and outputs the processed data as a reproducing audio signal. The input device inputs an operation information by the user. The controller controls the head and the memory and is inputted the operation information from the input device. The controller controls the memory to retain the data thereafter when data reproducing os stopped by a halt request made via the input device in the course of the data reproducing, and if the controller is received a request for resumption of the data reproducing from the input device, the controller controls the memory to start reading out the retained data in the memory.

According to a second aspect of the present invention, there is provided an audio reproducing apparatus. The audio reproducing apparatus comprises reproducing apparatus, a memory, a signal processor, an input device and a controller. The reproducing apparatus has a head which reads out from a recording medium. The memory stores the data outputted from the head. The signal processor processes on the data read out from the memory and outputs the processed data as a reproducing audio signal. The input device inputs an operation information entered by the user. The controller controls the memory and the reproducing mechanism. The controller is inputted the operation information from the input device. The controller controls the memory to retain the data thereafter when data reproducing is stopped by a halt request made via the input device the course of the data reproducing, and if the controller is received a request for resumption of data reproducing from the input device, the controller controls the memory to start reading out the retained data in said memory.

In embodiments of the above-described invention, at the time reproducing is stopped, data is accumulated in the storage means to a certain degree. The data left in the memory is kept as it is after the reproducing is stopped. When it is desired to resume the reproducing from the stopping point right after it is stopped, a reproducing signal can be output by reading out the data retained in the memory. In this way, reproducing data can be output even before the build-up process, the energizing process of the spindle and the servo is completed.

Embodiments of the present invention provide an audio reproducing apparatus which resolves the above-mentioned problems of known systems. Embodiments of the invention also provide a disc reproducing apparatus which allows an audio signal to be able to output even during a build-up process, a energizing process activated.

An enbodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 shows a block diagram of main components employed in an embodiment implementing an audio reproducing apparatus in accordance with the present inventions;

FIGURE 2 shows a flow chart of reproducing processing carried out by the embodiment;

FIGURE 3 shows an explanatory diagram used for describing data-transfer states during reproducing performed by the embodiment.

Referring to the drawings, the preferred embodiment of the present invention will be explained in detail. The embodiment implements a disc recording and/or reproducing apparatus as an audio reproducing apparatus which employs a magneto-optical disc as a recording medium. FIGURE 1 shows a block diagram of the disc recording and/or reproducing apparatus.

In FIGURE 1, reference numeral 1 is a magneto-optical disc. The magneto-optical disc 1 includes a transparent substrate, a recording layer and a protective layer. The substrate is made of a glass or a transparent resin material. The substrate has a pregroove. The pregroove is wobbled in a radial direction of the magneto-optical disc according to address data or an absolute time information and formed on the substrate in advance. The recording layer is formed on one surface of the substrate. The recording layer is made of a magneto-optical recording material. The protective layer is formed on the recording layer to protect the recording layer. Reference numeral 2 is a spindle motor. The spindle motor 2 rotationally drives the magneto-optical disc 1 at a constant linear velocity (CLV) or a constant angular velocity (CAV). In this embodiment, the magneto-optical disc is rotated by the spindle motor 2 at the constant linear velocity. Reference numeral 3 is an optical head. The optical head 3 radiates a light beam to the recording layer of the magneto-optical disc 1 during data recording operation or data reproducing operation. During the data recording operation, the intensity of the light beam radiated from the optical head 3 is higher than the intensity of the light beam during the data reproducing operation. During the data recording operation, the light beam radiated from the optical head 3 is heated the recording layer of the magneto-optical disc 1 to the Curie temperature. During the data reproducing operation, the optical head 3 is received the light beam reflected by the magneto-optical disc 1 and reads out the data of the magneto-optical disc for using the magnetic Kerr effect. The optical head 3 has a laser diode as a light beam source, a polarized beam splitter, an objective lens 3a and a photodetector. The optical system is constituted by the polarized beam splitter and the objective lens. The photodetector is received the light beam reflected by the magneto-optical disc 1. Reference numeral 4 is an actuator such as an electromagnetic actuator. The actuator 4 movably supports the objective lens 3a. The objective lens 3a is moved by the actuator 4 in a focusing direction which is parallel to an optical axis of the objective lens 3a and a tracking direction which is a radial direction of the magneto-optical disc 1. Reference numeral 5 is a translating mechanism of the optical head 3. The translating mechanism 5 includes a motor and translates the optical head 3 in the radial direction of the magneto-optical disc 1. Reference numeral 6 is a magnetic head. The magnetic head 6 is provided to oppose to the optical head 3 via the magneto-optical disc 1. The magnetic head 6 is supplied to an external magnetic filed modulated recording data to the magneto-optical disc 1. An RF amplifier 7 is supplied to output signals from the optical head 3. The output signals from the optical head 3 are processed by the RF amplifier 7. The RF amplifier 7 generates a focusing error signal, a tracking error signal and an RF signal. The RF amplifier 7 extracts ATIP (Absolute Time In Pregroove) information, an address information and a focus monitor signal from the output signal from the optical head 3. The ATIP information is a detecting signal of the wobbled-pregroove of the magneto-optical disc 1. The absolute time information is recorded on the magneto-optical disc 1 as the wobbled-pregroove. A second encoder/decoder 8 is supplied the RF signal from the RF amplifier 7. The RF signal is demodulated under EFM modulation and decoded under CIRC decoding. Digital data outputted from a memory controller, later explained, is encoded under CIRC encoding and modulated under EFM modulation by the second encoder/decoder 8. A servo circuit 9 is supplied to the focusing error signal, the tracking error signal and the ATIP information from the RF amplifier 7. The servo circuit 9 generates a focusing servo signal, a tracking servo signal, a sled drive signal and a spindle servo signal according to the output signal from the RF amplifier 7. The focusing servo signal and the tracking servo signal are supplied to the actuator 4. As a result, the objective lens 3a is moved by the actuator 4 in the focusing direction and the tracking direction. A focusing servo and a tracking servo is executed. The sled drive signal is generated by the servo circuit 9 according to the tracking error signal and supplied to the motor of the translating mechanism 5. The optical head 3 is translated by the translating mechanism 5 in the radial direction of the magneto-optical disc 1. The spindle servo signal is generated according to the ATIP information and is supplied to the spindle motor 2. As a result, the magneto-optical disc 1 is rotationally driven by the spindle motor at the constant linear velocity. An address decoder 10 is supplied the ATIP information from the RF amplifier 10. The address decoder 10 converts the ATIP information to an address data which is binary data. The address data from the address decoder 10 is supplied to the second encoder/ decoder 8.

Reference numeral 11 is a system controller as microcomputer. The system controller 11 is connected to a input device 19 and a display unit 20. The system controller 11 has a timer and a reset circuit, later explained. The system controller 11 controls the optical head 3, the second encoder/decoder 8, the servo circuit 9, a memory controller 12, later explained and

the display unit 20. The focus monitor signal and the ATIP signal outputted from the RF amplifier 7 are supplied to the system controller 11. The system controller 11 generates a track jump signal and a seek signal corresponding to the operation information from the input device 19. The optical head 3, the translating mechanism 5 and the spindle motor 2 is controlled by the system controller 11 according to the track jump signal or the seek signal. Sub-code data for control-operations and the address data output by the address decoder 10 are supplied to the system controller 11 through the second encoder/decoder 8 for use in a variety of control operations. In addition, a lock detection signal of a PLL circuit and a monitor signal are also supplied to the system controller 11 as well. The lock detection signal is used for generating a bit clock signal for the recording and reproducing operations. The monitor signal is, on the other hand, used for monitoring the missing-bit state of a frame-synchronization signal for reproducing data of the L and R channels.

The input device 19, such as a keyboard, includes a plurality of keys and is operated by the user. The input device 19 inputs operation informations which are supplied to the system controller 11. The display unit 20, such as LCD (Liquid Crystal Display), displays a time information and the other like information.

A memory controller 12 is controlled by the system controller 11. The memory controller 12 controls a memory 13, later explained. A memory 13 stores the digital data from the second encoder/decoder 8 and the digital data from a first encoder/decoder 14, later explained. The memory 13 is such as a random access memory (RAM). The storage capacity of the memory 13, for example, 1 Mbit. The memory 13 is written the digital data from the first encoder/decoder 14 at the transfer rate of 0.3 Mbit/sec. During the data recording operation, the digital data stored in the memory 13 is read out from the memory 13 at the transfer rate 1.41 Mbit/sec in a predetermined unit and supplied to the second encoder/decoder 8. The predetermined unit is, for example, 1 cluster. The 1 cluster includes 32 data sectors and 4 liking sectors. During the data reproducing operation, the digital data outputted from the second encoder/decoder 8 is written in the memory 13 at the transfer rate of 1.41 Mbit/sec. The digital data stored in the memory 13 is read out from the memory 13 at the transfer rate of 0.3 Mbit/sec by the memory controller 12.

The first encoder/decoder 14 is supplied the digital data stored in the memory 13 through the memory controller 12 and the digital audio signal from an analog to digital (A/D) convertor 18. The first encoder/decoder 14 compresses the digital audio signal from the A/D convertor 18 to about 1/5 digital data and expands the digital data from the memory 13. In the first encoder/decoder 14, an audio compress technique is used, for example, Modified DCT (Discrete Cosine Transform).

The A/D convertor 18 converts an analog audio signal inputted through an input terminal 17 to a 16 bit digital audio signal. A digital to analog (D/A) convertor 15 converts the digital audio signal from the first encoder/decoder 14 to an analog audio signal. The analog audio signal from the D/A convertor 15 is outputted from an output terminal 16.

Reference numeral 21 is a driving circuit of the magnetic head 6. The driving circuit 21 is supplied the recording data from the second encoder/decoder 8 and supplies to the driving signal to the magnetic head 6. As a result, the magnetic head 6 generates a modulated external magnetic field according to the driving signal.

In the above-described disc recording and/or reproducing apparatus, the recording data recorded on the disc 1 is read out by the optical head 3. The output signal of the optical head 3 is supplied to the RF amplifier 7. The RF signal of the RF amplifier 7 is once stored into the memory 13 by the memory controller 12 after undergoing EFM demodulation and CIRC decoding in the second encoder/decoder 8. At the transfer rate of 1.41 Mbit/sec, the recording data is read out from the magneto-optical disc 1 by the optical head 3 and the reproducing data is transferred from the optical head 3 to the memory 13. The digital data stored in the memory 13 is read out from the memory 13 at the transfer rate of 0.3 Mbit/sec by the memory controller 12 and is supplied to the first encoder/decoder 14. The first encoder/decoder 14 carries out processing on the digital data such as expansion processing. The decoded digital audio data is supplied to the D/A convertor 15 and converted to the analog audio signal. The analog audio signal is supplied to an external amplifier, not shown, through the output terminal 16. Finally the analog signal is reproduced and outputted typically as L and R audio signal.

When the magneto-optical disc 1 is recorded the audio signal, the audio signal inputted through the input terminal 17 is supplied to the A/D convertor 18 and converted to the digital audio signal. The digital audio signal is supplied to the first encoder/decoder 14 and processed compression processing by the first encoder/decoder 14. The digital data from the first encoder/decoder 14 is once written in the memory 13 through the memory controller 12 at the transfer rate of 0.3 Mbit/sec. The digital data stored in the memory 13 is read out from the memory 13 at 1.41 Mbit/sec by the memory controller 12 and supplied to the second encoder/decoder 8. The digital data read out from the memory 13 undergoes encode processing such as the CIRC encoding and the EFM modulation in the second encoder/decoder 8. The recording data outputted from the second encoder/decoder 8 is supplied to the driving circuit 21. The magnetic head 6 generates the external magnetic filed according to the driving signal from the driving circuit 21 and

applies the external magnetic field to the magneto-optical disc 1. At this time, the optical head 3 is controlled by the system controller 11 and radiates the light beam in which the intensity of the light beam is the intensity enough to record the recording data on the magneto-optical disc 1. The magneto-optical disc 1 is irradiated to the light beam from the optical head 3. The recording layer of the magneto-optical disc 1 is heated by the light beam emitted from the optical head 3 and supplied to the external magnetic filed according to the recording data from the magnetic head 6. As a result, the recording data according to the analog audio signal is recorded on the magneto-optical disc 1.

An operation to reproduce data carried out by the embodiment having the configuration describes above is explained by referring to a flow chart shown in FIGURE 2 and a model diagram of FIGURE 3.

As shown in FIGURE 2, the recording data reproducing from the magneto-optical disc 1 begin with a step F101 when the user presses to a play key of the input device 19. The flow then continues to a step F102 to accomplishing a energizing process for the data reproducing. In the energizing process, the system controller 11 controls the optical head 3 to radiate the light beam and supplies a control signal to the servo circuit 9. The servo circuit 9 execute a focus search operation according to the control signal from the system controller 11. The servo circuit 9 generates a focus search signal and supplies the focus search signal to the actuator 4 of the optical head 3. The actuator 4 moves the objective lens 3a in the focusing direction corresponding to the focus search signal. The focus servo loop is closed when the focusing error signal across zero cross point. later on, the focusing servo is executed. The spindle motor 2 is supplied to a drive signal from the servo circuit 9. The spindle motor 2 begins to rotate the magneto-optical disc 1 and is controlled until the rotational speed attains a predetermined value. The servo circuit 9 supplies the tracking error signal to the actuator 4 and the tracking servo loop is closed. The flow then continues to a step F103 to determine whether or not the energizing process has been completed. When the energizing process has been completed, it is possible to read out the recording data from the magneto-optical disc 1. So, the recording data is read out from the magneto-optical disc 1 by the optical head 3. If the energizing process is found completed at the step F103, the flow continues to a step F104. Otherwise, the flow returns to the step F102.

At the step F104, the output signal of the optical head 3 is supplied to the second encoder/decoder 8 through the RF amplifier 7. The output signal of the optical head 3 is written to the memory 13 after undergoing EFM demodulation and CIRC decoding in the second encoder/decoder 8 at the transfer rate of 1.41 Mbit/sec. The digital data of the memory 13 is read out from the memory 13 at the transfer rate of 0.3 Mbit/sec. It should ne noted that excess between operations to write data into and read it out from the memory 13.

In the course of the data reproducing, the memory 13 is controlled by the memory controller 12 to execute the above-described reproducing operation. The digital data read out from the memory 13 is supplied to the first encoder/decoder 14. The first encoder/decoder 14 carries out processing on the digital data. The digital data is further converted in an analog audio signal by the D/A convertor 15 and is finally outputted the analog audio signal through the output terminal 16. A model showing the flow of the data reproducing is shown in FIGURE 3 (a).

In the course of the data reproducing operation, the user may operate a stop key of the input device 19 with a step F105. The system controller 11 generates control signals and supplies these control signals to the optical head 3 and the spindle motor 2. The optical head 3 is turned off the radiation of the light beam by the control signal of the system controller 11. The spindle motor 2 is stopped the rotation. As a result, the data reproducing operation is stopped with a step F106. At this time, the operation to read out from the memory 13 is stopped. The stopped state at which no reproducing data shown in FIGURE 3 (b). If a stop operation is found out requested at the step F105, on the other hand, the flow returns to the step F104 to continue the production processing.

Some digital data remains accumulated in the memory 13 at the time the data reproducing operation is stopped. Since it is due to the difference in the transfer rate between operation to write data into and read it out from the memory 13. Assume the storage capacity of the memory 13 is 1 Mbit. In this case, about 0.9 second digital data is left in the memory 13 after the halting of the data reproducing operation. In other word, the about 0.9 second digital data is equivalent to about 3 second analog signal. The system controller 11 and the memory controller 12 do not clear the digital data left in the memory 13, keeping it in the memory 13 as it is. At this time, the timer of the system controller 11 set a predetermined time and starts to count time with a step F107.

While the counting operation of the timer of the system controller 11 is being carried out, the flow goes through steps F108 and F111. In this case, the predetermined value set to the timer is, for example, one-minute. The step F108 is taken to fine out whether or not the play key of the input device 19 is operated during the one-minute period of time. If the play key is found operated at the step F108, the flow continues to a step F109. Otherwise, the flow continues to the step F111 to check whether the one-minute period of time has lapsed. If the one-minute period of time is found to have lapsed at the step F111, the flow continues to a step F112 to clear the contents of the

memory 13 and terminate the data reproducing processing. The digital data left in the memory 13 is cleared by a clear signal from the clear circuit of the system controller 11. If the one-minute period of time is found not to have lapsed at the step F111, on the other hand, the flow returns to the step F108. At the step F109, the digital data left in the memory 13 is read out while the energizing process is being performed. The flow then continues to a step F110 to find out if the energizing process has been completed. If the energizing process is found not completed yet at the step F110, the flow returns to the step F109 to continue the energizing process. Otherwise, the flow go back to the step F104 in order to resume the stopped reproducing.

As above described, the processing continues to the step F109 if the user again operated the play key of the input device 19 prior to the time out, that is before the one minute period of time has lapsed since the request to stop the data reproducing operation. At the step F109, the operation to read out the reproducing data retained the memory 13 is started immediately. At the same time, the energizing process is executed to, among other operations, rotate the spindle motor as well as start the focus search, turn on the focusing servo and the tracking servo. At the step F109, the energizing process is under way and, thus, no data is read out from the magneto-optical disc 1. However, the digital data is read out from the memory 13 and outputted to the terminal 16 as an analog audio signal. The state of the energizing process carried out at the step F109 is illustrated in FIGURE 3(c).

Later on, the energizing process is completed in, for example, 2 second. When the energizing process is completed, the optical head 3 is allowed to read out data from the magneto-optical disc 1. The optical head 3 is accessed the restart position of the magneto-optical disc 1 by the translating mechanism 5 according to a control signal from the system controller 11. The restart position of the magneto-optical disc 1 continue to the end address of the digital data left in the memory 13. When the optical head 3 is arrived the restart position, the optical head 3 start to read out data from the magneto-optical disc 1 as indicated by the transition from the step F110 to the step F104 shown in FIGURE 2. The read out data from the magneto-optical disc 1 is written in the memory 13 through the RF amplifier 7 and the second encoder/decoder 8. The operation to read out from the memory 13 also resumed as well. As a result, the analog audio signal is continuously outputted from the output terminal 16. In this way, the data reproducing operation suspended by the stop request is put back to a normal state which is shown in FIGURE 3 (a).

In this embodiment, resuming reproducing within a predetermined period of time after a temporary halt allows a reproducing musical signal to be output right after a request for the resumption as a continuation of the music prior to the temporary halt in spite of the fact that the energizing process is still being executed in the disc recording and/or reproducing apparatus as described above.

The above embodiment is particularly suitable for an audio reproducing apparatus installed in a vehicle. Applications of the present invention include resumption of musical reproducing after a temporary stop of the reproducing of the music at a toll gate on a highway or the like. An audio reproducing apparatus with such a function offers an operational response characteristic which is excellent as far as the user is concerned.

In the above-described embodiment, the predetermined time set to the timer of the system controller 11 us one-minute. Considering the application of an audio reproducing apparatus to be installed in a vehicle, however, a predetermined time set to the timer of three minutes is also possible. As described above, some wait time is provided after reproducing is stopped. If a request for reproducing is made after the wait time has lapsed, the reproducing is carried out starting from the first track of the disc. Accordingly, confusion resulting from an incorrect operation by the user can be avoided.

The embodiment discussed so far applies the present invention to a disc recording and/or reproducing apparatus. It should be noted, however, that the present invention can also be applied to an apparatus dedicated only for reproducing as well. In addition, the recording medium employed in the reproducing apparatus, to which the present invention is applied, is not limited to the magneto-optical disc. A reproducing apparatus using an optical disc such as a CD (Compact Disc) or a DAT (Digital Audio Tape) will also work as well. As long as a memory is provided at the end stage of the data reading apparatus, data can always be accumulated in the memory to a certain degree by, for example, reading out data from the CD at a speed twice the speed of reading out data from the memory.

Claims

1. A disc reproducing apparatus comprising:

readout means for reading out data from a recording medium;

storing means for storing the data outputted from said readout means;

signal processing means for processing the data from said storing means and outputting the processed data as a reproducing audio signal;

input means for inputting an operation information entered by the user; and

control means for controlling said storing means and said readout means and inputted the operation information from said input means, said

control means for controlling said storing means to retain the data thereafter when data reproducing is stopped by a halt request made via said input means in the course of the data reproducing, and if said control means is received a request for resumption of data reproducing from said input means, said control means controls said storing means to start reading out the retained data in said storing means.

2. A disc reproducing apparatus according to claim 1, wherein said apparatus further comprises servo means for controlling said readout means, said servo means is controlled by said control means to complete an energizing operation before the retained data in said storing means is all read out in resuming the data reproducing.

3. A disc reproducing apparatus according to claim 1, wherein said control means comprises timer means ; said timer means counts a predetermined time since the data reproducing is stopped.

4. A disc reproducing apparatus according to claim 1, wherein said control means comprises reset means which generates a reset signal when a predetermined time is passed since the data reproducing is stopped, the reset signal from said reset means is supplied to said storing means.

5. An audio reproducing apparatus comprising:

a reproducing mechanism including a head, said head for reading out data from a recording medium;

a memory for storing the data outputted from said head;

a signal processor for processing on the data read out from said memory and outputting the processed data as a reproducing audio signal;

input device for inputting an operation information entered by the user; and

controller for controlling said memory and said reproducing mechanism, said controller being inputted the operation information from said input device, said controller for controlling said memory to retain the data thereafter when data reproducing is stopped by a halt request made via said input device the course of the data reproducing, and if said controller is received a request for resumption of data reproducing from said input device, said controller controls said memory to start reading out the retained data in said memory.

6. An audio reproducing apparatus according to claim 5, wherein said reproducing mechanism comprises a driving apparatus which relatively drives the recording medium to said head.

7. An audio reproducing apparatus according to claim 6, wherein said reproducing mechanism further comprises a servo circuit controlling said driving apparatus, said servo circuit is controlled by said controller to complete an energizing operation before the retained data in said memory is all read out in resuming the data reproducing.

8. An audio reproducing apparatus according to claim 5, wherein said controller comprises a timer, said timer counts a predetermined time since the data reproducing is stopped.

9. An audio reproducing apparatus according to claim 5, wherein said controller comprises reset circuit which generates a reset signal when a predetermined time is passed since the data reproducing is stopped, the reset signal from said reset circuit is supplied to said memory.

FIG 1

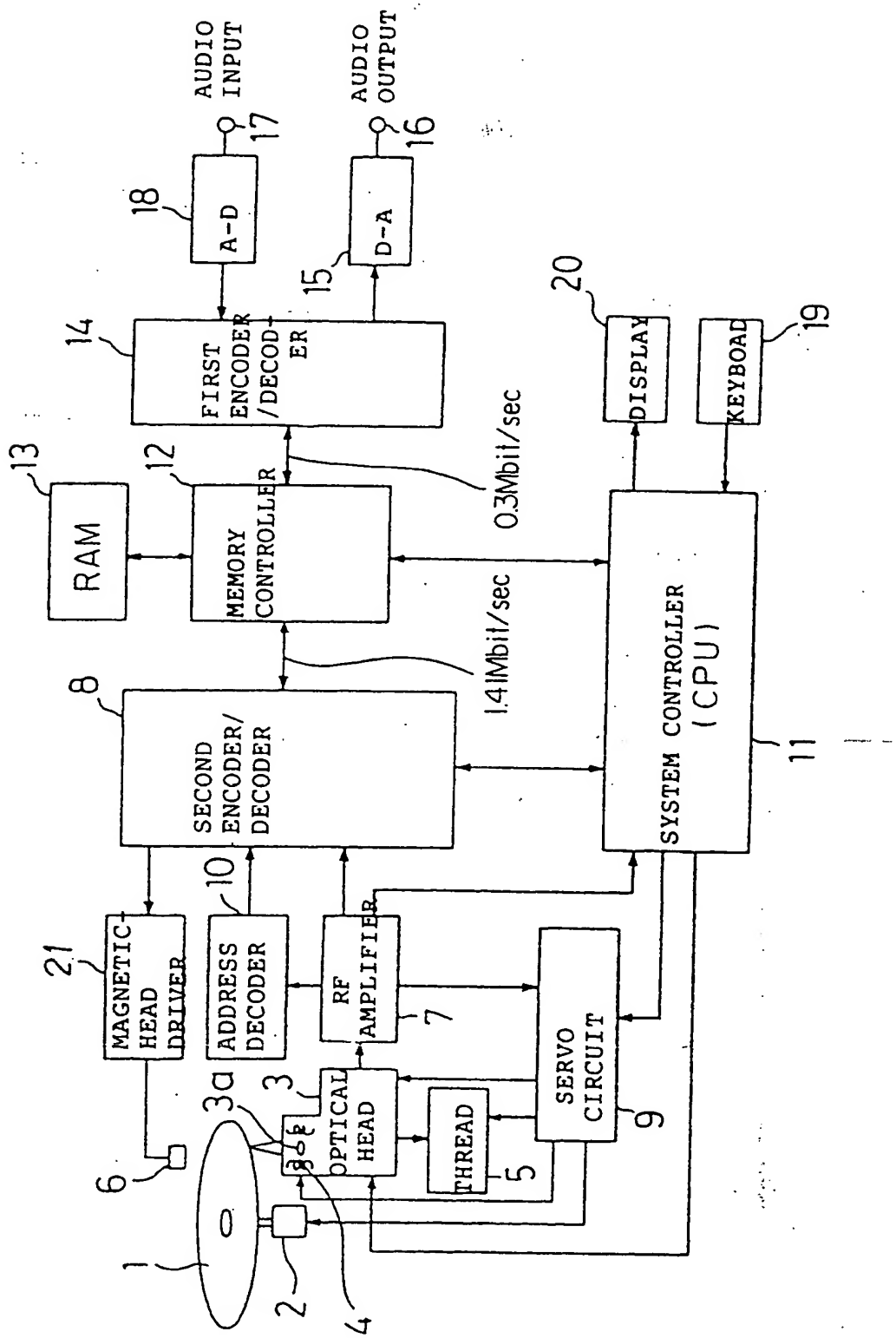
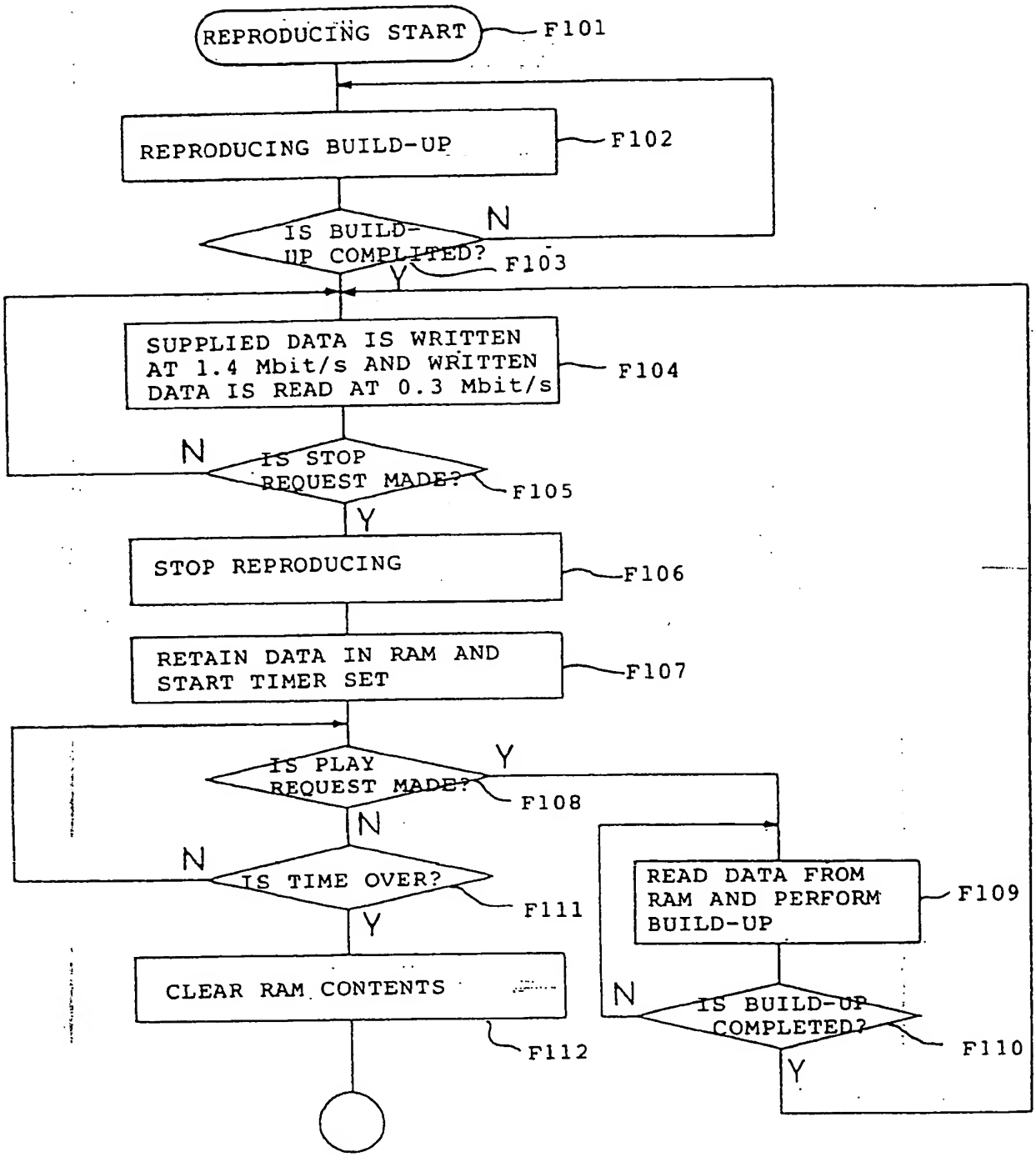

AUDIO INPUT
AUDIO OUTPUT
17
16
18
A-D
D-A
15
20
14
FIRST ENCODER /DECODER
DISPLAY
KEYBOAD
19
13
12
RAM
MEMORY CONTROLLER
0.3Mbit/sec
1.4Mbit/sec
8
SECOND ENCODER/ DECODER
SYSTEM CONTROLLER (CPU)
11
21
10
MAGNETIC HEAD DRIVER
ADDRESS DECODER
RF AMPLIFIER
7
SERVO CIRCUIT
3
3a
OPTICAL HEAD
THREAD
9
5
6
1
2
4

FIG. 2


REPRODUCING START
F101
REPRODUCING BUILD-UP
F102
IS BUILD-UP COMPLITED?
F103
N
Y
SUPPLIED DATA IS WRITTEN AT 1.4 Mbit/s AND WRITTEN DATA IS READ AT 0.3 Mbit/s
F104
IS STOP REQUEST MADE?
F105
N
Y
STOP REPRODUCING
F106
RETAIN DATA IN RAM AND START TIMER SET
F107
IS PLAY REQUEST MADE?
F108
Y
N
IS TIME OVER?
F111
N
Y
CLEAR RAM CONTENTS
F112
READ DATA FROM RAM AND PERFORM BUILD-UP
F109
IS BUILD-UP COMPLETED?
F110
N
Y

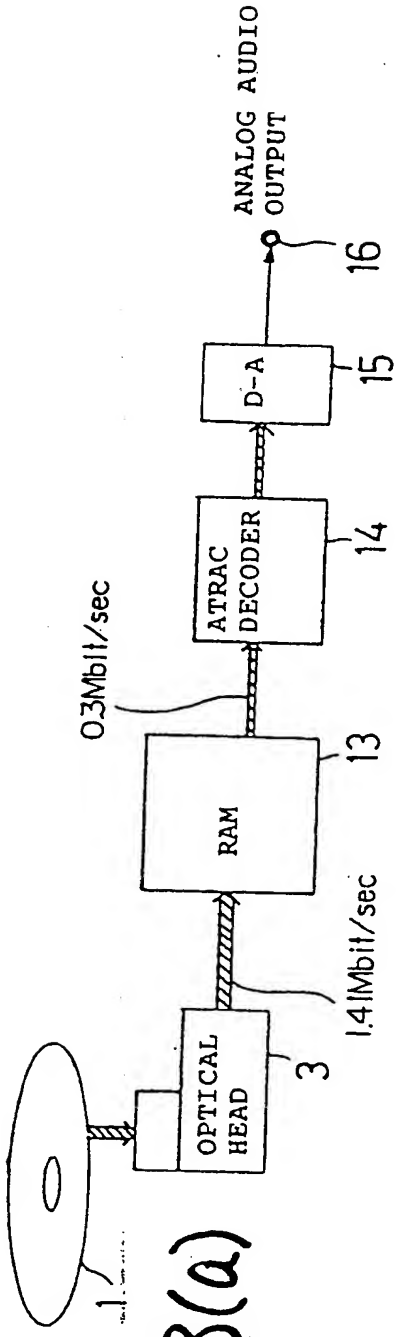


FIG. 3(a)

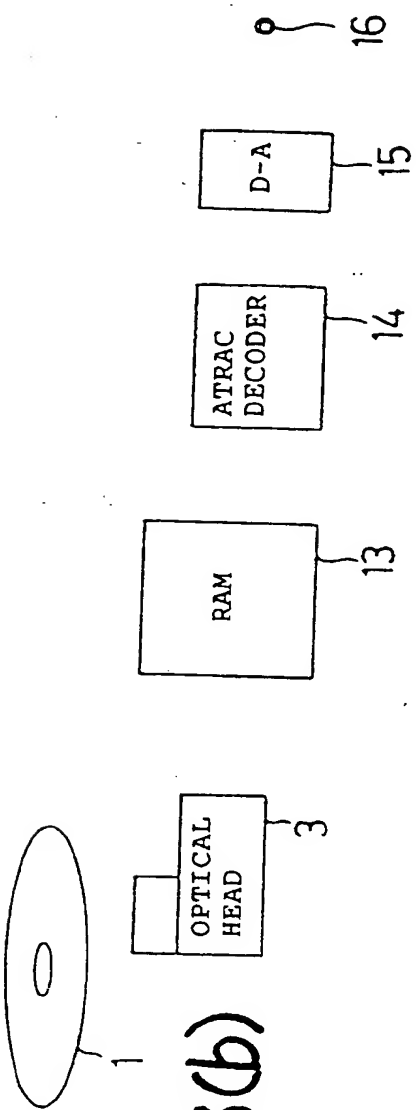


FIG 3(b)

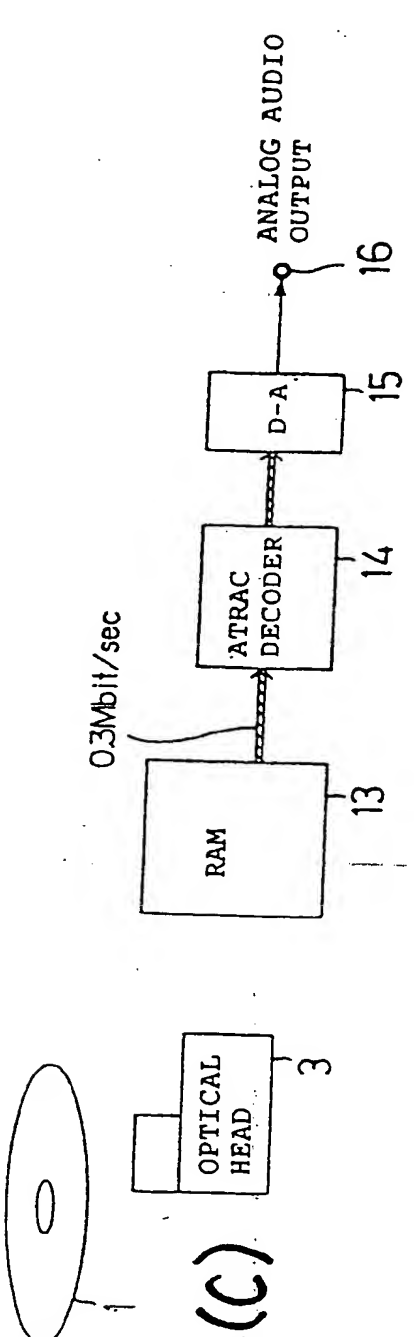


FIG. 3(c)

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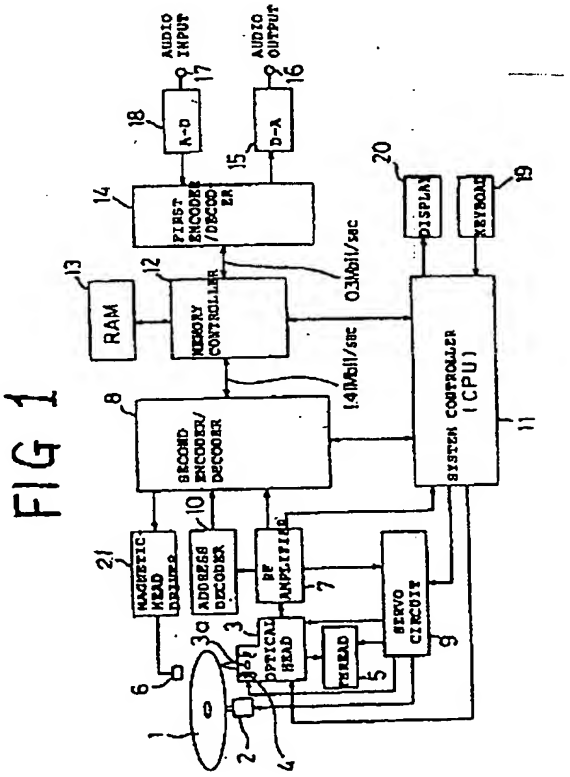
(54) Audio reproducing apparatus.

(57) An audio reproducing apparatus for used a disc-shaped recording medium. The reproducing apparatus includes a head, a memory, a signal processor, an input device and a controller. The head reads out data from the disc-shaped recording medium. The memory is stored the readout data outputted from the head. The signal processor processes the data from the memory and outputs the processed data as a reproducing audio signal. The input device inputs an operation information by the user. The controller controls the head and the memory and is inputted the operation information from the input device. The controller controls the memory to retain the data thereafter when data reproducing os stopped by a halt request made via the input device in the course of the data reproducing, and if the controller is received a request for resumption of the data reproducing from the input device, the controller controls the memory to start reading out the retained data in the memory.

FIG 1



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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	US-A-4 878 129 (S.YASUDA ET AL) * column 7, line 50 - column 8, line 22 *	1,5,6	G11B19/02
A	EP-A-0 260 722 (K.K.TOSHIBA ET AL) * column 10, line 26 - column 12, line 18 *	1,5,6	
A	EP-A-0 274 755 (PIONEER) * column 9, line 27 - column 11, line 13 *	1,5,6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			G11B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 February 1994	Kelperis, K

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